PIANC Working Group 138

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Presentation Outline

- PIANC – What is this?
- Working Group 138 Background
- Terms Reference – Scope and Goal
- Components

Report Documentation Page

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PIANC

Permanent International Association of Navigation Congresses

- "PIANC is the ***global*** organisation providing guidance for sustainable waterborne transport infrastructure for ports and waterways."
- "PIANC is the forum where professionals around the world join forces to provide expert advice on cost-effective, reliable and sustainable infrastructure to facilitate the growth of waterborne transport."
- "Members include national governments and public authorities, corporations and interested individuals. Providing expert guidance and technical advice PIANC provides guidance to public and private partners through high-quality technical reports. Our international working groups develop ***regular technical updates on pressing global issues to benefits members on shared best practices***."

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WG 138
Terms of Reference (Scope)

- Objective - Establish a mechanical and electrical engineering working group to assemble "lessons learnt" from navigation lock operating systems.
- Best practices for mechanical and electrical navigation systems

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WG 138
Terms of Reference (Scope)

- Product - Provide a comprehensive summary of lessons learned and best practices that can be incorporated into future lock operating machinery designs. The report will include a summary of relevant guidance documents from various countries. The working group will provide guidance on the choice of systems to use in future designs for navigation structures.

WG 138
Terms of Reference (Scope)

<u>Matters to Be Investigated</u>

- Ease of Troubleshooting
- Vulnerability of Exterior Mounted Components to Environment
- The use of custom designed components with long lead times
- Impact damage to machinery components
- PLC vs. relay based (hardwire)
- Hydraulic vs. electromechanical
- Design for less labor intensive maintenance

Working Group 138 – Mechanical Electrical Lessons Learned

- Members – Mechanical and Electrical Design Engineers
- Backgrounds, mostly governmental but also private industry
- Primarily Europe, United States, Canada

Working Group 138

Schedule

- Started February 2010
- Completed June 2012

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Hydraulic Drives

- Hydraulic Compact Drives – Self contained, movable

  - Plug and Play
  - Particularly suited to smaller locks

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Hydraulic Drives

- Maintainability
- Open vs Closed Hydraulic Systems
- Actuators
  - ► Cylinder Materials – Ceramic Coated
  - ► USACE Engineering Construction Bulletin 2009-3
- Position Sensing
- Seals
- Cylinder Supports

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Hydraulic Drives

- Hydraulic Fluid
  - Biodegradable
  - Mineral Oil
- Pumps
- Reservoirs
- Compensators/Breathers
- Manifolds
  - Coatings
- Piping/Hose/Connectors

Hydraulic Drives

- Filters
- Heaters
- Rotary Actuators
- Position Indication/Sensing
  - Magnetoresistive
  - Magnetorestrictive
  - External to cylinder
- Supports

Hydraulic Drives

- Ceramic Coated Cylinder at Chittendon Lock

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Mechanical Drives

- Systems
  - Miter Gate/Sector Gear Drives

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Mechanical Drives

- Systems
  - Filling/Emptying Valve Drives

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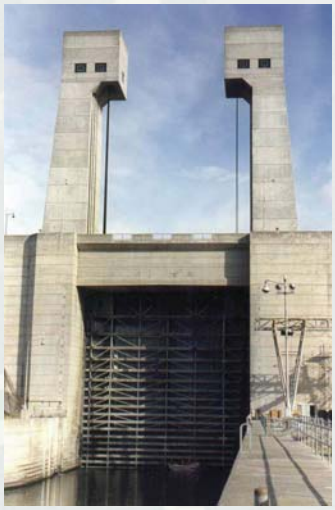
Mechanical Drives

- Systems
  - Vertical Lift Gate Drives



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Mechanical Drives

- Systems
  - Dam Gate Hoists

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Mechanical Drives

- Systems
  - Bulkhead Cranes and Emergency Gate Hoists

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Mechanical Drives

- Components
  - Self lubricating bushings
    - Appropriate use of materials, clearance, testing
  - Gears and gear reducers
    - Lubrication, duty cycle
  - Linear mechanical actuators

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Mechanical Drives

- Components (Cont'd)
  - Wire rope
    - Type and material selection
  - Couplings
    - Type
  - Brakes
    - Best practices
  - Lubrication
    - Synthetic
    - Selection

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Mechanical Drives

- Components
  - Lifting Chains
    - Appropriate use of materials
    - Stainless Steel and Aluminum Bronze
    - Maintenance Free

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Other Drives and Systems

- Air Bubbler Deicing Systems
- Inflatable Dams
- Generator Systems
- Tow Haulage and Winch Systems
- Dewatering Systems
- Floating Mooring Bitts
- Ship Arrestors

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Air Bubbler Systems

- Best Practices for Components and Maintainability

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Inflatable Dams

- Best Practices
- Installations

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Tow Haulage Systems

- Best Practices
- Mechanical vs Hydraulic

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Lock Dewatering Systems

- Best Practices

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Floating Mooring Bitts

- Best Practices

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Ship Arrestor Systems

- Best Practices
- Cables vs Booms

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Electrical

- Motors
- Speed Control
  - ► Variable Frequency Drive Systems
- Safety
  - ► Interlocks
  - ► Interlock Failures Lessons Learned
- PLC and/or Relay (Hardwire) Systems

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Electrical

- Starters
- Sensors
- Limit Switches and Position Sensing

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Maintenance

- Design for less maintenance
- Maintenance Strategies
- Preventative Maintenance
- Fix as Fail
- Reliability and Availability

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Needs

- Case Studies – Reports
- More Lessons Learned

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Conclusion

- Provide Mechanical and Electrical Design Lessons Learned
- Compliment existing Engineering Guidance and Manuals

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Web Sites

- PIANC USA: www.pianc.us
- PIANC International: www.pianc-aipcn.org

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